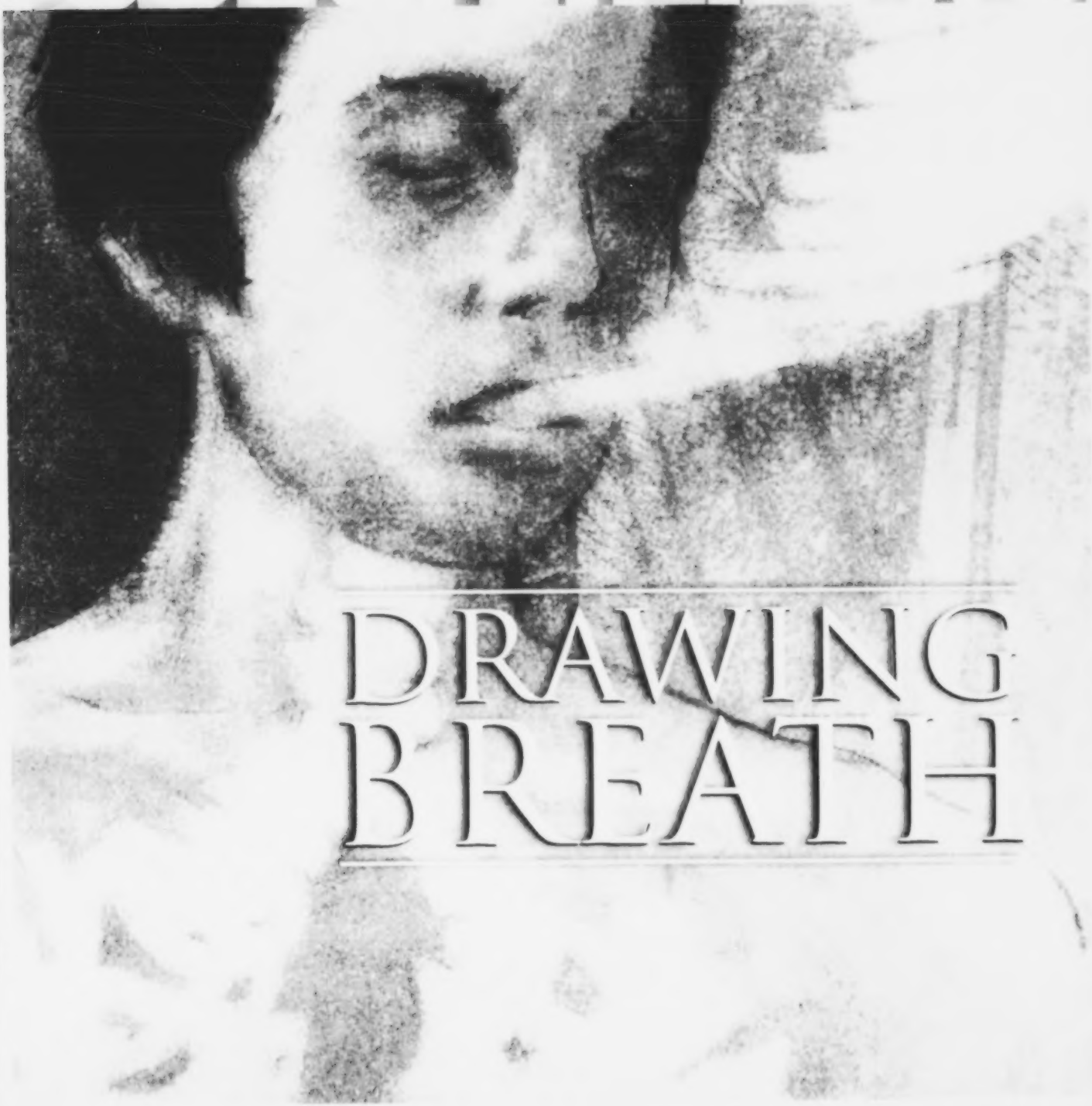
ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

ahfmr news



DRAWING BREATH

On the Cover

Jeff Kulak is a third year design student at the University of Alberta who will soon depart for a year of study at the University of New South Wales in Sydney, Australia. He likes to draw, silkscreen and take pictures. The cover piece was done in charcoal.

AHFMR Mission

AHFMR supports a community of researchers who generate knowledge whose application improves the health and quality of life of Albertans and people throughout the world. AHFMR's long-term commitment is to fund health research based on international standards of excellence and carried out by new and established investigators and researchers in training.

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AHFMR
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research news

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FALL 2004

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Production Notes

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The career of Dr. Joseph Martin is truly a "small-town-Alberta boy makes good" story.

Born in Bassano, southeast of Calgary, Dr. Martin received his medical degree from the University of Alberta in 1962, and then rounded off his education with clinical experience in neurology and neurophysiology, followed by a Ph.D. in anatomy. In 1997 he was appointed dean of medicine at Boston's world-renowned Harvard University. Dr. Martin recently returned to Alberta to chair AHFMR's 4th International Board of Review (IBR)—an in-depth review of the Foundation's operations which must occur every six years.

As an Alberta success story, Dr. Martin recognizes another of the province's triumphs when he sees it. "I don't think it can be overestimated how important AHFMR's investment in science has been for this province," he says. "I graduated from U of A at a time when the clinical training here was superb, but there was very little in the way of research opportunities. The establishment of the Foundation in 1980 completely revolutionized that. It allowed Alberta to recruit outstanding scientists from around the world and establish world-class research centres, and it resulted in the province's universities becoming recognized internationally for their research contributions." Given his own impressive research and academic career, along with the authority of his position at Harvard, Dr. Martin knows whereof he speaks.

"AHFMR funding allows scientists to focus on their research," he points out, "and the outcome of that has been astonishing. The share of money that now comes to Alberta from the federal Canadian Institutes of Health Research has grown enormously. And the spinoff in the community, in terms of jobs and the economy, would have been unthinkable without this strong base in science."

When asked to identify AHFMR's greatest strengths leading to this success, Dr. Martin points without hesitation to the Foundation's unique position independent of both government and universities. "The autonomy given to the Foundation permits it to participate in the recruitment of the very best people to do research, while establishing the criteria of excellence for the universities to follow."

Dr. Martin is equally quick to identify AHFMR's future challenges. "We all recognize that research-funding sources are limited," he states. "No institution can do everything. So one of the IBR's key recommendations is to set priorities—to focus on a few areas of great research strength and become world-class in those areas. It is an opportunity as well as a challenge."

One such area of opportunity might involve the wealth of population-health data available in this province. Dr. Martin explains that in other academic settings in which he has worked, information about the incidence of diseases such as cancer has not been available to researchers. Allowing researchers to access this body of data could be a powerful way to link basic and clinical research—bench to bedside. He explains that in the future, important work will be done at

ABOVE: DR. JOSEPH MARTIN

each level of the research spectrum. Fundamental understanding of the genetics of disease mechanisms could allow the development of very selective agents that will treat cancer, Alzheimer's, and other diseases. Analyzing the genetic makeup of individuals could allow us to identify the best treatment for a particular person—rather than the kind of shotgun approach that we use now, treating everybody with the same drug. "But all of this will occur only if it is done in concert with health research, health-services research, and understanding the health of the public," he emphasizes. "Alberta is very well positioned for this kind of work."

Dr. Martin wants to leave Albertans with one more thought: "It is so important that the general public appreciate how successful AHFMR has already been, and how much has been accomplished," he says. "Important because, as far as we have already come, an increased investment of public dollars in the Foundation would have an even greater impact on the economy of this province, and allow it to grow even more as an international resource in the world of biomedical science and clinical investigation."

The chances of anyone referring to a broken wrist as a "lucky break" are slim. Yet for many people, a fractured wrist can be a fortunate event. That's because a wrist fracture is often an early warning sign of osteoporosis.

A lucky

This type of fracture forecasts an increased risk of hip and spine fractures over the next 10 to 20 years. Appropriate treatment could halve the risk of a future fracture, improving quality of life for these people while saving healthcare dollars.

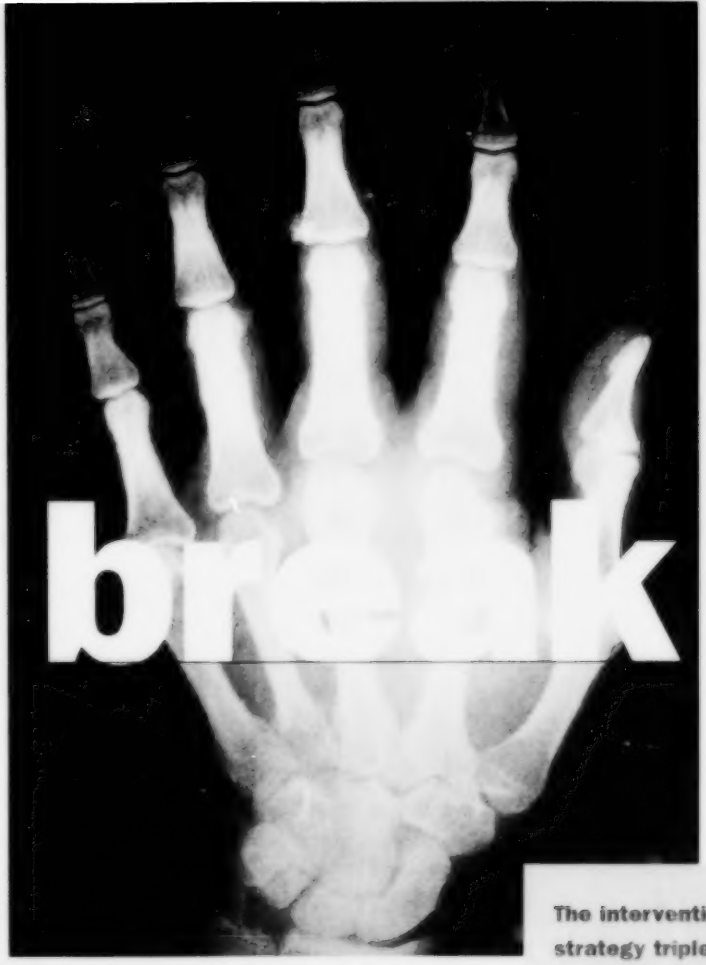
"A wrist fracture is a sentinel event in the natural history of osteoporosis," explains Heritage Population Health Investigator Dr. Sumit Majumdar from the University of Alberta. "It is the most common symptomatic fracture related to osteoporosis. The question is: What are we doing about it?"

Not a whole lot, up until now. While guidelines suggest a preventive policy of identifying people with typical osteoporosis-related fractures and targeting them for treatment, this simply isn't done. Dr. Majumdar, a specialist in internal medicine as well as a researcher, reviewed the literature and found that rates of testing for and treating osteoporosis a year after a wrist fracture are less than 20%.

"We call this a 'care gap'," he explains. "It is the gap between what we know we should do and what we are actually doing in the community.

"A wrist fracture is a sentinel event in the natural history of osteoporosis."

LEFT: DR. SUMIT MAJUMDAR



The intervention strategy tripled the rate of testing and treatment for osteoporosis.

It takes anywhere from 5 to 20 years for published evidence to get into the regular practice of medicine. There's a real need to accelerate the adoption of good evidence."

With colleagues from Capital Health, the University of Alberta, and the University of Calgary, Dr. Majumdar designed a strategy to increase the detection and treatment of osteoporosis. Participants in the study (102 in total, including 47 control subjects) were recruited from among wrist-fracture patients 50 years of age or older who were treated at the emergency departments of the Royal Alexandra and University of Alberta hospitals in Edmonton. The intervention was information-based, meant to ensure that patient and physician would be discussing the same reliable and up-to-date information about osteoporosis and the same agenda for prevention.

All patients received appropriate and usual care in the emergency ward, except where take-home information was concerned: control subjects were given information about falls and home safety, whereas those in the intervention group were given a one-page summary of osteoporosis information. Furthermore, when the family physicians of this latter group were sent faxed notification that their patients had been seen in the hospital for a wrist fracture, the doctors were reminded that these people were now considered at increased risk for osteoporosis and should have bone density tests. Brief treatment recommendations were also included. The osteoporosis information given patients and doctors was the same, specially developed and endorsed by five local experts in the field.

Within one week of the fracture, study personnel called all the patients, to briefly review the information in their respective handouts and encourage them to see their family physician.

The study found that the intervention strategy tripled the rate of testing and treatment for osteoporosis within six months of a wrist fracture. The finding was so significant that the study was cut short so that all patients could receive the benefit of the intervention. This was the first controlled study to address this clinical problem, and it was published in the high-profile journal *Annals of Internal Medicine*.

"I wasn't surprised that the intervention made a difference; however, I was surprised by the magnitude of the effect," says Dr. Majumdar. "We used rigorous science to show how this sort of knowledge-translation intervention can work. I hope this study will be a paradigm for bridging the care gap in other conditions, such as diabetes and cardiovascular disease, that often present at the interface of acute care and primary care."

Heritage Population Health Investigator Dr. Sumit Majumdar is an assistant professor in the Division of General Internal Medicine at the University of Alberta. He is also a CIHR New Investigator. The osteoporosis study was funded by the Medical Services Budget Innovation Fund (Alberta Medical Association and Alberta Health and Wellness) and AHFMR.

Selected publication

Majumdar SR, Rowe BH, Folk D, Johnson JA, Holroyd BH, Morrish DW, Maksymowych WP, Steiner IP, Harley CH, Wirzba BJ, Hanley DA, Blitz S, Russell AS. A controlled trial to increase detection and treatment of osteoporosis in older patients with a wrist fracture. *Annals of Internal Medicine* 2004 Sep 7;141(5):366-373.

DOING BETTER FOR vascular disease

DISEASES THAT AFFECT THE VEINS AND ARTERIES—

DIABETES, STROKE, HEART, AND KIDNEY DISEASE—ARE TAKING THEIR TOLL ON CANADIANS. HEART DISEASE AND STROKE ACCOUNT FOR MORE THAN ONE-THIRD OF ALL DEATHS IN THIS COUNTRY.

There are an estimated 1.9 million cases of chronic kidney disease in Canada today. And then there's the burden of diabetes, which currently affects more than a million Canadians. If left untreated, diabetes can lead to heart disease, kidney disease, nerve damage, impotency, and eye disease.

"Vascular disease is the most significant disease group of our time. It is the number one killer and cause of hospitalization," says Heritage Population Health Investigator Dr. Finlay McAlister, a professor of internal medicine at the University of Alberta. "We need to do a better job, not only of treating vascular disease but of preventing it as well."

Doing better for vascular disease is the focus of a new Alberta-based research project. Led by Dr.

McAlister, the team is made up of 26 researchers from the universities of Alberta and Calgary. Funding for the three-year, $900,000 project comes from a new AHFMR funding initiative–Programs in Health Services Research.

The project begins at an opportune time. The range of available diagnostic and therapeutic techniques for vascular disease has broadened considerably in recent years. There is now ample evidence to demonstrate the effectiveness of treatments for high blood pressure, cholesterol, and other risk factors for vascular disease, but this information has been slow to become incorporated into clinical practice.

"On average, it takes about ten years for innovations to get into practice," notes Dr. McAlister. "It's imperative that we shorten this time frame."

To do this, the research team is studying the gaps between the available evidence and what is currently being offered to patients. They will work in three areas: identifying the gaps between evidence and usual practice, understanding the barriers that prevent evidence from moving into practice, and developing strategies to break down those barriers and close the gaps.

For example, one of these gaps occurs in the treatment of hypertension (high blood pressure). Although research has shown that controlling hypertension reduces vascular problems significantly, most patients with hypertension do not have their blood pressure lowered as far as guidelines recommend. Various groups within the research team will undertake survey work to clarify the number of Alberta patients with hypertension, study the rationale behind current practice in treating hypertension, and carry out interventional studies designed to improve the dissemination of knowledge to patients and their physicians.

Dr. McAlister says that an important aspect of this project is the involvement of people from Alberta Health and Wellness, Capital Health, and the Calgary Health Region. "We have policy-makers involved in this research from the beginning. We'll get their perspective on what the key issues are. As a researcher, I don't know what the top priorities are for decision-makers. Their involvement will also ensure that the strategies we develop will roll out to patients in a timely fashion.

"We like to say this project is going from the laboratory bench to the patient's bedside to the boardroom and back again. This integrated approach is the best way to achieve our goal of improving patient care by effectively and efficiently moving evidence into healthcare practice."

"VASCULAR DISEASE IS THE NUMBER ONE KILLER AND CAUSE OF HOSPITALIZATION."

DR. FINLAY MCALISTER

Heritage Population Health Investigator Dr. Finlay McAlister is an associate professor in the Division of General Internal Medicine at the University of Alberta and a Fellow of the Institute of Health Economics. His research is supported by the Canadian Institutes of Health Research, the Heart and Stroke Foundation of Canada, the Canadian Stroke Network, and the University Hospital Foundation.

Selected publication

Majumdar SR, McAlister FA, Furberg CD. From knowledge to practice in chronic cardiovascular disease: a long and winding road. *Journal of the American College of Cardiology* 2004 May [illegible];43(10):1738-1742.

ARTWORK: MARLENA WYMAN. ORCHID HEART, 1996. ETCHING, WATERCOLOUR ON PAPER. IMAGE: 17.4 X 19.7 CM. SHEET: 24.8 X 32.5 CM. COURTESY OF THE ALBERTA FOUNDATION FOR THE ARTS.

Suicide is the second leading cause of death in Canada for children and youth between the ages of 10 and 24. And while many suicide prevention programs have been developed over the past 30 years to address this problem, suicide rates remain high.

YOUTH suicide PREVENTION

Enter AHFMR's Health Technology Assessment (HTA) unit, which assesses the benefits and risks of drugs, equipment, and other health technologies. In response to a request from the Alberta Mental Health Board (AMHB), the unit reviewed the effectiveness of suicide prevention programs for children and youh.

"After we started this review, we discovered how big the topic was," says Dr. Bing Guo, HTA Research Associate. "We decided to first identify what suicide prevention programs had already been evaluated in the research, and then to focus on programs for children and youth."

Although the topic may be enormous, little research seems to have been done on the actual effectiveness of suicide prevention programs. Dr. Guo, in collaboration with co-author and HTA assistant director Christa Harstall, found only 10 studies which used comparison groups to evaluate school-based suicide prevention programs, all conducted in either junior or senior high schools. While no two of these programs were alike, they were of four general types: course content promoting suicide awareness in the general school population; suicide prevention programs, directed at the general school population, focusing on behavioural change and coping strategies; programs aiming to reduce the risk of suicidal behaviours in students who had been in contact with a suicide victim, and suicide prevention programs that focused on life-skill training and social support for adolescents at high risk.

While there is no real consensus on the most effective school-based prevention program, two

"Now we can use the review to help develop a province-wide suicide-prevention strategy."

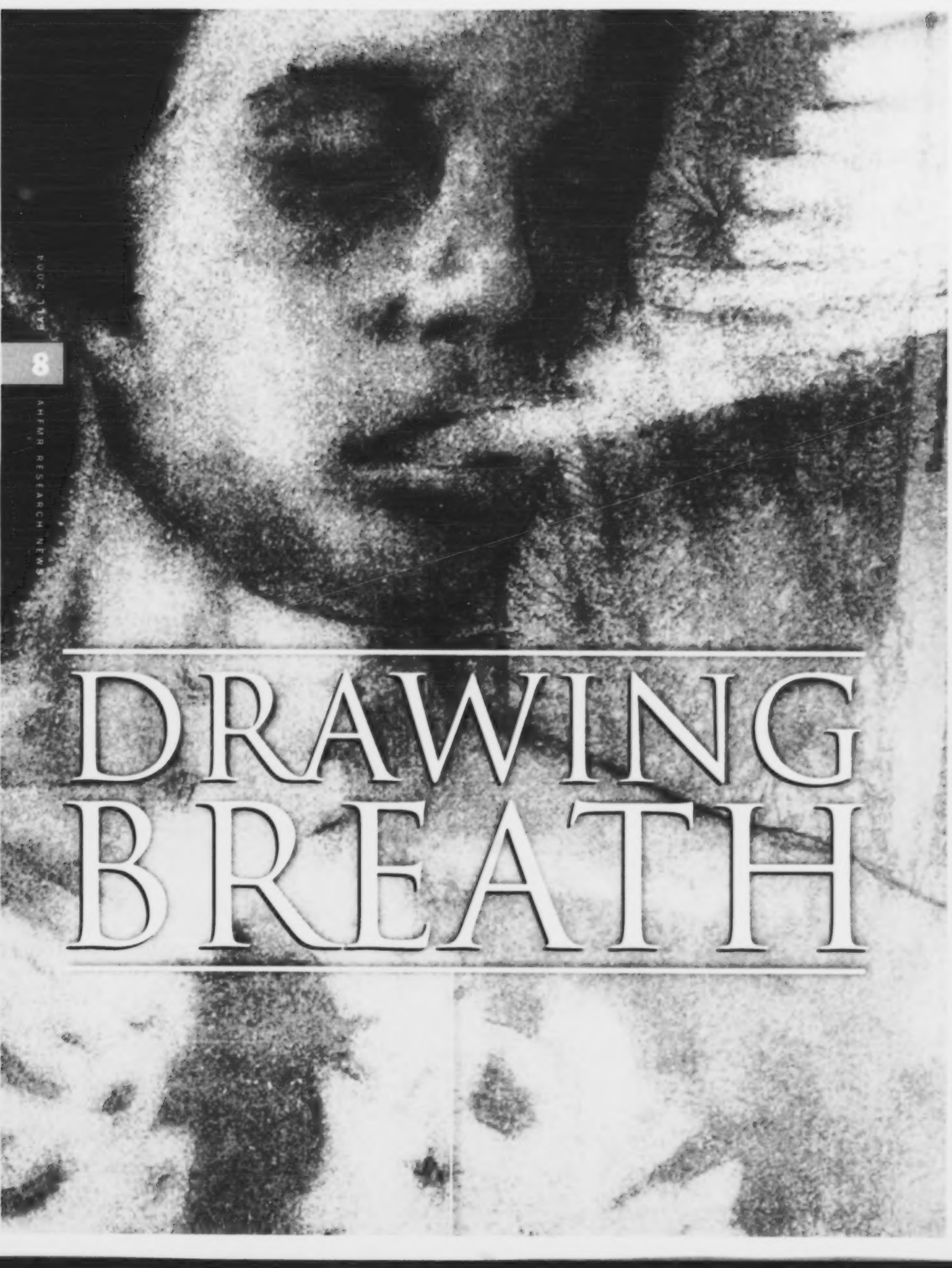
studies that used an assessment tool to identify students at high risk for suicide seemed to show some benefit in the high-risk group. "There is definitely a need for more and better-quality research in this area to support decision-making," says Dr. Guo.

The HTA review has already attracted a great deal of interest for its assessment of existing programs. A number of organizations have expressed interest or cited the report's findings; for example, Alberta Children's Services; the Alberta Public Health Association; an aboriginal suicide prevention team; a teen suicide prevention forum in Hamilton, Ontario; a Canadian conference on injury prevention; as well as two American suicide prevention experts. International colleagues have also taken note. The director of the Health Evidence Network (a new information service of the World Health Organization) requested further details to share with Belgium's health ministry, which has been examining the idea of implementing suicide prevention programs in schools.

The HTA review has attracted a great deal of interest.

And what does the report mean to the AMHB, who requested the review in the first place? "The HTA department did this review for us at a time when the Alberta Mental Health Board was first taking on a role in relation to suicide prevention," says Chris LaForge, provincial director for Suicide Prevention and Mental Health Promotion at the AMHB. "We needed a review of the existing evidence around various approaches. Now we can move forward and use the review to help develop a province-wide suicide-prevention strategy. The health technology assessment of this area is fundamentally important to guide our next steps in the fight against youth suicide."

LEFT: DR. BING GUO



DRAWING BREATH

YOU PROBABLY KNOW KIDS LIKE THESE:

Ashley is the one left behind in the mad rush down the street to catch the ice-cream vendor. She ends up sitting on the curb trying to catch her breath. Michael is the one who caught the same cold everyone else had, but he was off school for more than a week. You heard later that he had even been rushed to the hospital.

These are the kind of children who inspire Edmonton pediatrician Dr. Darryl Adamko. "Kids are suffering from asthma. As a doctor, it's hard to see this, day after day. I started to wonder why common viruses—the kind that give most people a simple cold—can make asthmatics so sick."

This is the question Dr. Adamko explores as a Heritage Clinical Investigator. He suspects that a type of white blood cell called an eosinophil is at the heart of the problem. Eosinophils release certain proteins that kill the cells lining the airways and cause inflammation. But eosinophils are not all bad. Dr. Adamko has shown that a certain protein released by eosinophils can kill some viruses. "In asthma, the problem is that there are so many eosinophils, they are in the wrong places, and they are releasing so many different proteins. As a result, they're doing more harm than good."

"As a doctor, it's hard to see this, day after day."

Dr. Adamko's particular research focus is to discover just how eosinophils are activated to release proteins. He has shown that eosinophils release proteins in response to viral infection only in the presence of T cells, which are white blood cells critical to the immune response. This suggests there is some kind of signalling mechanism between T cells and eosinophils. Understanding this pathway could lead to a new target for asthma drugs.

"Right now I'm not after targets. I'm trying to understand how things work," says Dr. Adamko. "That's what I like about research. You have an idea, you test it out, see if you're right. The ideas build on each other."

Dr. Adamko notes that the University of Alberta is one of the best places in the world to work on eosinophils. His office is across the hall from that of Heritage Scientist Dr. Redwan Moqbel, an

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DR. DARRYL ADAMKO

Patient education

DR. ANDREW CAVE

The Canadian Lung Association has a motto on its website: "Don't let asthma manage you; you manage your asthma." That's good advice, says Dr. Andrew Cave, a family physician and University of Alberta family medicine professor. "The problem is that asthma is an individual disease. Your asthma is different than another person's. You have to understand how to manage your own disease. This is what makes asthma education so important."

Most asthma patients in Alberta miss out on specialized education programs. Qualified asthma educators typically work in hospitals and asthma centres, but 70% of asthmatics do not go to a hospital for treatment. They see their family physician. This makes the doctor's office the logical place for patients to receive asthma education.

Easier said than done. Family physicians' busy practices do not lend themselves to education, and most practices do not have a nurse on staff who might cover that role. Dr. Cave began to wonder whether an asthma educator working part-time in a number of doctor's offices might be the answer. He recently received funding for a research project to test a special education program for patients with asthma and chronic obstructive pulmonary disease (COPD). It will be delivered one-on-one in doctors' offices by a trained asthma/COPD educator.

Dr. Cave hopes to involve 50 doctors' offices throughout the province in the study. Patients who participate will be followed for one year. Various measures of success will be used, including quality of life, lung function, and healthcare utilization.

Three health regions are affiliated with the project: Capital Health, the Calgary Health Region, and the David Thompson Health Authority. "There is a real interest in finding out the best way to spend money on helping patients with asthma and COPD," says Dr. Cave. "Keeping them out of hospital is an important step, but not the only one. We need to find cost-effective ways to deliver patient education that improves quality of life."

Dr. Andrew Cave is a full professor and director of research in the Department of Family Medicine at the University of Alberta. His "Respiratory Educators in Primary Care" study is funded by the Health Research Fund, administered by AHFMR on behalf of Alberta Health and Wellness. Dr. Cave is also on the scientific steering committee of the AIMS (Alberta Improvements for Musculoskeletal Disorders Study) project at the Institute of Health Economics.

Selected publication

Cave AJ, Wright A, Dorrett J, McErlain M. Evaluation of a nurse-run asthma clinic in general practice. *Primary Care Respiratory Journal* 2001;10(3):65-68.

"We're part of a worldwide research effort on asthma."

international authority on the immunobiology of eosinophils and their role in airway damage in asthma. Dr. Moqbel conducts basic research on the proteins released by eosinophils, as well as applied research on ways to block their release. For example, he recently began a new research program into how an eosinophil-derived enzyme may be involved in switching the immune system's "normal" pattern of fighting infection to the allergic pattern of response in asthmatics. Dr. Moqbel is convinced that this switch, a key immunological event, could be diverted back to the appropriate immunological response.

"We're benefiting from and are a part of a worldwide research effort on asthma," Dr. Moqbel says. "So much more is known than when I began 27 years ago. This is a very exciting time in eosinophil and asthma research."

In another new project, Dr. Moqbel is using nuclear magnetic resonance (NMR) to detect eosinophil "fingerprints" in asthma. Because NMR can identify tiny amounts of certain markers of inflammation in human fluids such as saliva, it may be possible to distinguish among different types of asthma and thus offer treatment that is customized to the patient. To further this research, Dr. Moqbel and his collaborators at the Canadian National High Field NMR Centre and the University of Alberta Hospital are in the process of establishing the Pulmonary

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Health Institute at the University of Alberta.

"There's great potential for the development of individualized, precise diagnosis and therapies for asthma and airway inflammation," says Dr. Moqbel. "Our objective is to treat the patient rather than the umbrella disease because asthma is a complex of varied syndromes." He expects this non-invasive NMR technique to have applications beyond asthma to chronic obstructive pulmonary disease (COPD) and pneumonia.

"Lung diseases account for a lot of the suffering in this world."

That's important because these are some of the major respiratory diseases the world is facing, says Dr. Dean Befus, the AstraZeneca Canada Inc. Chair in Asthma Research at the University of Alberta. "Lung diseases account for a lot of the suffering in this world, and yet many of them do not have a high profile."

Dr. Befus notes that in Alberta alone, about 200,000 people have asthma. By 2020, it's expected that COPD will be the number-three cause of death in the world. Tuberculosis still kills 3 to 5 million people a year. Lung cancer continues to have one of the poorest survival rates of all cancers. Cystic fibrosis is the most common fatal genetic disease. Infectious diseases of the lungs, such as community-acquired pneumonia, are on the rise. And new diseases are emerging, such as SARS and strains of avian influenza that can infect humans.

Concerns about the increasing toll of respiratory disease on society have led to new partnerships among researchers and healthcare professionals. Dr. Befus is a good example. One of Canada's foremost asthma researchers (his work focuses on the basic mechanisms of allergic inflammation), Dr. Befus is also the director of the Alberta Asthma Centre. Established in 1993, the Centre is dedicated to asthma-related health promotion.

Recognizing the need for even greater collaboration and interaction, Dr. Befus was recently involved in establishing the COPD and Asthma Network of Alberta (CANA), a province-wide respiratory disease network of healthcare professionals, industry, government, and public representatives. "The responsibilities for COPD and asthma have been quite fragmented," explains Dr. Befus. "Now there's a groundswell of interest in sharing resources and strengthening networks. By working together, we can facilitate the flow of patients through the healthcare system, give consistent messages to patients, and champion causes in an organized manner. This isn't basic research, but it is a critical part of the overall effort to find better ways to help people with respiratory diseases."

Collaboration is also vital to the work of Heritage Senior Scholar Dr. Gregory Funk, a basic scientist who studies the neural control of breathing during the perinatal period (i.e., just before and after birth). He came to the University of Alberta from New Zealand in 2003. Dr. Funk was attracted by the opportunity to work with a group of basic and clinical respiratory researchers in Alberta, including Heritage Scientists Dr. Klaus Ballanyi and Dr. John Greer, and Heritage Clinical Investigator Dr. Bernard Thébaud—all from the University of Alberta and all members of the Perinatal Research Centre—and Heritage Scholars Dr. Richard Wilson and Dr. Marc Poulin at the University of Calgary.

"Being able to join a dynamic group such as this is an incredible and rare opportunity," says Dr. Funk.

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DR. DEAN BEFUS

ABOVE: DR. REDWAN MOQBEL

Dr. Gregory Funk studies the neural control of breathing during the perinatal period.

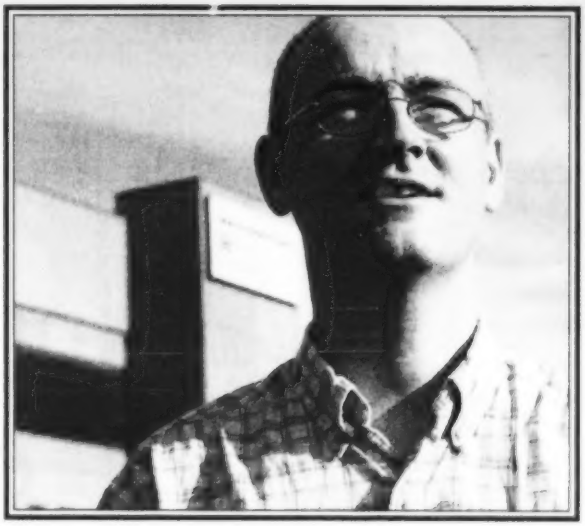
"AHFMR funding has enabled us to come together in Alberta. Real support for generating such an interactive environment is extraordinary. Researchers often lament their lack of local collaborators. I'm spoiled for choice."

Dr. Funk's interest lies in establishing how the respiratory rhythm is generated by regions in the brainstem, as well as how that rhythm is transformed into proper breathing by motor neurons that drive the muscles. If the rhythm-generating system becomes unstable, it can actually stop for variable periods (central apnea). If the activity of muscles that keep the airway open and pump muscles—such as the diaphragm—is unbalanced, negative pressure can actually block the airway (obstructive apnea).

Neurochemical signals are crucial to keeping the breathing systems in proper balance. This balance is particularly fragile during the perinatal period, when all systems are changing dramatically. Dr. Funk wants to understand what these chemicals are, what they are doing, and how they interact with other neurochemicals to control breathing.

One of Dr. Funk's collaborators is Heritage Scholar Dr. Richard Wilson, a physiology professor at the University of Calgary. Dr. Wilson also studies the neuronal control of breathing, examining fundamental mechanisms as well as doing more applied research. In 2003, Dr. Wilson's team discovered an important role of the neuropeptide pituitary adenylate cyclase-activating polypeptide (PACAP) in the regulation of breathing. They investigated why mice lacking this peptide are more likely to die suddenly about two weeks after birth.

DR. GREGORY FUNK



"Research is the key to eliminating SIDS."

This phenomenon is strikingly similar to sudden infant death syndrome (SIDS)—the sudden and unexpected death of an apparently healthy human infant, whose death remains unexplained even after a complete investigation. SIDS peaks in infants 2 to 4 months old, and is rare before 1 month and after 12 months of age. In addition to his basic research on the physiological effects of PACAP, Dr. Wilson is also collaborating with Dr. Torben Bech-Hansen at the University of Calgary to examine whether defects in the gene that codes for PACAP are present in the DNA of babies who have died of SIDS.

"This is expensive, time-consuming research because PACAP works in a complicated pathway, and we don't know exactly where in this pathway defects might be," says Dr. Wilson. "There's certainly no guarantee of success, but this is where our basic research is pointing, and we would be negligent not to explore this avenue. SIDS education programs, promoting such recommendations as putting babies to sleep on their backs and reducing their exposure to cigarette smoke, have reduced the SIDS death rate by 50% and continue to be our most valuable weapon against SIDS. However, research is the key to eliminating SIDS."

Enthusiasm for research is the hallmark of the Alberta scientists who are studying the respiratory

ABOVE: DR. RICHARD WILSON

system. They take nothing for granted. "Breathing is one of our most robust behaviours—it continues even in very sick humans and animals," says Dr. Wilson. "Breathing is quintessential to human health and well-being, yet we still don't know much about its fundamental mechanisms. That's what makes research in this area so fascinating. There's always something new to learn."

Heritage Clinical Investigator Dr. Darryl Adamko is an assistant professor in the departments of Pediatrics and Medicine (Division of Pulmonary Medicine) at the University of Alberta. His research is also supported by the Hospital for Sick Children Foundation.

Heritage Scientist Dr. Redwan Moqbel is director of the University of Alberta's Pulmonary Research Group and a full professor in the departments of Medicine and Medical Microbiology and Immunology. He is the current president of the International Eosinophil Society. His research is also supported by the Canadian Institutes of Health Research (CIHR), the Alberta Lung Association, Merck Frosst Canada Ltd., the University of Alberta Hospital Foundation, and the Endodontic Endowment Fund of the Department of Dentistry at the University of Alberta.

Dr. Dean Befus is the AstraZeneca Canada Inc. Chair in Asthma Research and a full professor in the Department of Medicine at the University of Alberta. He is also director of the Alberta Asthma Centre. His research is supported by CIHR, the National Institutes of Health (NIH) in the United States, and the Alberta Lung Association.

Heritage Senior Scholar Dr. Gregory Funk is an associate professor in the Department of Physiology at the University of Alberta, a member of the Perinatal Research Centre, and adjunct associate professor in the Department of Physiology at the University of Auckland, New Zealand. His research is also supported by CIHR, the Canada Foundation

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DR. MARK GIEMBYCZ

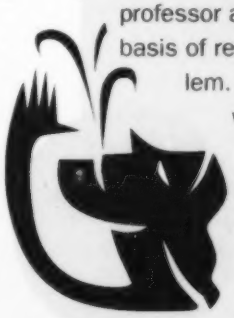
Better medications for pulmonary diseases

For those suffering from chronic obstructive pulmonary disease (COPD), drawing a breath can be a difficult, frightening struggle. The disease makes it difficult to move air into and out of the lungs.

COPD includes two major diseases—chronic bronchitis and emphysema—and generally affects people over 60. Approximately 15% to 20% of smokers will develop COPD.

Of all respiratory disorders, COPD is the most prevalent: more than 35 million people are affected worldwide. It is the fourth leading cause of death in North America, and is expected to take the number three spot by 2020. The Canadian Lung Association notes that COPD is also on the rise in Canada. Already, more than 750,000 Canadians suffer from the disease.

For Heritage Senior Scholar Dr. Mark Giembycz, a pharmacology professor at the University of Calgary who studies the inflammatory basis of respiratory diseases, COPD presents an interesting problem. While inflammation in asthma can be treated effectively with steroids, the airway inflammation that characterizes stable COPD is resistant to these drugs. "The search had been on for some time for an anti-inflammatory that works across the board for people suffering from COPD, as steroids do for asthmatics," he says.



Enter a new family of compounds called the phosphodiesterase (PDE) inhibitors. Dr. Giembycz has been working with these drugs for the past 15 years. While they appear to be effective, they still need some tweaking. One problem is their "low therapeutic ratio", which means that the amount you need to take in order to get the anti-inflammatory benefit is very close to the amount that causes side effects such as nausea, vomiting, and headaches. Dr. Giembycz's research has focused on improving the effectiveness of PDE inhibitors.

"The mechanisms of how these drugs work are highly complex," he says. "The beauty of them is that they work for most sufferers of COPD. So the push is on to ensure their safety and tolerability. These drugs are desperately needed."

Heritage Senior Scholar Dr. Mark Giembycz is an associate professor in the Department of Pharmacology and Therapeutics at the University of Calgary. His research is also supported by CIHR.

Selected publication

Smith SJ, Brookes-Fazakerley S, Donnelly LE, Barnes PJ, Barnette MS, Giembycz MA. Ubiquitous expression of phosphodiesterase 7A in human proinflammatory and immune cells. *American Journal of Physiology – Lung Cellular and Molecular Physiology* 2003 Feb;284(2):L279-L289.

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DR. MARK GIEMBYCZ

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for Innovation (CFI), the Alberta Science and Research Authority (ASRA), the Health Research Council of New Zealand, and the Marsden Fund.

Heritage Scholar Dr. Richard Wilson is an assistant professor in the Department of Physiology and Biophysics at the University of Calgary. His research is also supported by the Calgary Health Region, the Heart and Stroke Foundation, CIHR, and NSERC (Natural Sciences and Engineering Research Council of Canada).

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A NEW APPROACH TO CYSTIC FIBROSIS

Cystic fibrosis (CF) is the most common fatal genetic disease affecting young Canadians. It is estimated that 1 in every 2,500 children born in Canada has CF. Approximately 3,400 Canadian children, adolescents, and adults are living with this disease today. CF involves a strict daily routine of therapy and medication, and despite progress in treatment, there is still no cure. Most patients eventually succumb to infections of the airways and lung failure.

The discovery of the genetic defect responsible for CF in 1989 opened up the possibility of curing the disease by replacing the defective CF gene. Despite promising results in the lab, making gene therapy work in patients has proven difficult, and a cure is probably years away. Nonetheless, tremendous strides have been made in understanding the CF gene. One of the scientists involved in this international research effort is Heritage Senior Scholar Dr. Marek Duszyk, a physiology professor at the University of Alberta.

DR. MAREK DUSZYK

Dr. Duszyk examines why these ion channels don't form in patients with CF.

Dr. Duszyk studies airway epithelial cells—specialized cells that line our airways from the nose to the lungs. Up until the 1980s, these cells were thought to simply act as a barrier. Researchers now know that they perform a number of important regulatory functions. "When something is wrong with the airway epithelial cells, there are serious consequences," says Dr. Duszyk. "Cystic fibrosis is an example."

Epithelial cells have in their membranes ion channels which open and close to transfer chloride and sodium, and to direct the flow of water into and out of the cells. "The regulation of water flow is why our airways don't dry out in dry air or become waterlogged in humid air," explains Dr. Duszyk. The CF gene is critical to the formation of ion channels. When the gene is defective, the ion channels do not form and the movement of chloride is severely hampered. As a result, cells absorb more water than normal, depleting water from the mucus and making it thick and sticky—a symptom of cystic fibrosis.

Dr. Duszyk examines why these ion channels don't form in patients with CF. It turns out that the defective CF gene makes a defective version of the CFTR protein, a protein which is essential to the formation of ion channels. Individual epithelial cells recognize the defects in the protein, and do not let it move to the membrane to form an ion channel. "We think the CFTR protein, even though it is defective, may still function adequately as an ion channel. One of our goals is to find a way to fool the quality-control mechanism in cells so that they let the defective protein move to the membrane. Of course, this needs to be selective. We can't let all defective proteins go.

"This wouldn't be a cure for CF, but it would improve the quality of life for CF patients," says Dr. Duszyk. "That's what we are aiming for right now."

Heritage Senior Scholar Dr. Marek Duszyk is an associate professor in the Department of Physiology at the University of Alberta. His research is also supported by CIHR and the Canadian Cystic Fibrosis Foundation.

Selected publication

Szkotak AJ, Man SFP, Duszyk M. The role of the basolateral outwardly rectifying chloride channel in human airway epithelial anion secretion. *American Journal of Respiratory Cell and Molecular Biology* 2003 Dec;29(6):710-720.

ABOVE: DR. SAMUEL SCHÜRCH

AN ESSENTIAL SUBSTANCE IN THE LUNGS

Premature babies face a number of challenges when they are born, and breathing problems are usually at the top of the list.

Many cases of respiratory distress result from insufficient surfactant in the lungs. By around 35 weeks' gestation, the lungs are usually mature enough to produce an adequate amount of surfactant for normal lung function. However, especially for babies born earlier than 28 weeks' gestation, the lack of surfactant is a life-threatening condition.

Dr. Schürch recently turned his attention to the role of surfactant in asthma.

"Surfactant replacement therapy has saved the lives of many premature infants," says Heritage Scientist Dr. Samuel Schürch, a physiology and biophysics professor at the University of Calgary. Having studied with the inventor of surfactant replacement therapy, Dr. Schürch has spent the intervening 30 years investigating the structure and function of surfactant. The artificial surfactant administered to newborns in respiratory distress is a watery suspension of fatty substances (lipids) and proteins designed to reduce the tension of the interior surfaces of the lung. It spreads out like oil on water, forming a very thin film that coats the air passages and air sacs (alveoli) in the lungs, to keep them flexible and open until the infants can produce their own natural surfactant.

From saving premature infants, Dr. Schürch has broadened his horizons considerably. "It sometimes surprises me," he says, "how my basic research has taken me into so many different areas: developing laboratory technology, collaborating with physicians on asthma treatment, even studying the effect of environmental pollutants."

In the course of his research, Dr. Schürch developed a machine that measures the surface tension of pulmonary surfactant. With the help of AHFMR Technology Commercialization funding, his captive bubble surfactometer was patented more than 10 years ago and further developed with the help of Dr. Michael Schoel, a research associate at the University of Calgary. It is now standard in almost all the major pulmonary labs around the world. The machine can be used to test a variety of substances that reduce surface tension, not just lung surfactant, and Dr. Schürch hopes to pursue opportunities for commercialization on a larger scale.

Dr. Schürch has recently turned his attention to the role of surfactant in asthma. In collaboration with a University of Calgary colleague, pulmonary pathologist Dr. Francis Green, he is studying how surfactant can reverse airway constriction and prevent the collapse of small airways in this disease. Says Dr. Schürch, "It's a new area that is very promising. It may be possible to design a therapeutic surfactant to help asthmatics."

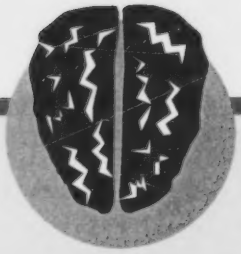
Wider application of his research specialty has led Dr. Schürch recently to begin a pilot study, with University of Calgary colleague Dr. Matthias Amrein, to look at ultrafine particles—airborne particles, generated mainly from combustion, that are present in pollution such as diesel exhaust. The particles are incredibly tiny—mere nanometres in size, smaller than many viruses. They can even pass through the membranes in the lung walls to enter the bloodstream and have been shown to pose a substantial health threat.

"This is a big human health issue, as ultrafine particles have been associated not only with respiratory diseases but with cancer, cardiovascular diseases, and nervous system disorders," Dr. Schürch explains. "We need to better understand what's going on with these particles."

Heritage Scientist Dr. Samuel Schürch is a full professor in the Department of Physiology and Biophysics at the University of Calgary. His research is also supported by CIHR, the Alberta Lung Association, and the Swiss National Science Foundation.

Selected publication

Geiser M, Schürch S, Gehr P. Influence of surface chemistry and topography of particles on their immersion into the lung's surface-lining layer. *Journal of Applied Physiology* 2003 May;94(5):1793-1801.



GENES AND DECISION-MAKING IN THE BRAIN

DR. CAROL SCHUURMANS

Dr. Carol Schuurmans is an expert in developmental biology, studying the decision-making processes that take place at the molecular level in our brains.

She has a long history with AHFMR, from the Heritage Scholarship she currently holds all the way back to her undergraduate years in Edmonton when, as part of a Heritage Summer Studentship Program, she spent a summer gaining hands-on research experience under the supervision of a University of Alberta researcher.

Dr. Schuurmans finds the interactions among different genes fascinating.

"It's good for undergraduate students to have opportunities in a lab to learn what it is to be a researcher and be exposed to different things," she says.

After this insight into the life of a researcher, Dr. Schuurmans decided to pursue a career in science, completing a B.Sc. and M.Sc. at the University of Alberta before moving on to Toronto for her Ph.D. After six years in France as a post-doctoral trainee, Dr. Schuurmans came back to Alberta, and has made Calgary her home. This time, AHFMR funding helped her set up her lab at the University of Calgary and provided senior personnel support.

Dr. Schuurmans is passionate about developmental biology, and finds the complexity of the interactions among different genes fascinating. She studies the development of the cerebral cortex, the frontal region of a mammal's brain, using the mouse as a model system. Dr. Schuurmans enjoys the collaborative environment at the University of Calgary and also collaborates with researchers around the world on a cross-species, basic-science project. Her colleagues include Dr. Patrick Blader in Toulouse, France, who studies zebrafish; Dr.Erich Jarvis at Duke University in the US, who studies songbirds; and Dr. Dan Brown, a computer scientist in Waterloo, Ontario.

"We're using a cross-species approach to look at how genes are regulated in different species and how the brain has evolved," Dr. Schuurmans explains. "We're looking at the same gene in each

Dr. Schuurmans has a long history with AHFMR.

species, and at the regulatory regions that drive the expression of the gene. The part of the brain that expresses these genes in the mouse doesn't actually exist in fish and birds, so we're asking the question: How did this cerebral cortex evolve from lower vertebrates?" The project may one day provide information that could be relevant in stem-cell therapy.

Dr. Carol Schuurmans is an AHFMR Scholar and an assistant professor in the Department of Biochemistry and Molecular Biology at the University of Calgary. She also receives funding from CIHR (Canadian Institutes of Health Research) and the Human Frontier Science Program. She works with the Genes and Development Research Group at the University of Calgary and is an associate member of the Neuroscience Research Group.

Selected publications

Schuurmans C, Armant O, Nieto M, Stenman JM, Britz O, Klenin N, Brown C, Langevin L-M, Seibt J, Tang H, Cunningham JM, Dyck R, Walsh C, Campbell K, Polleux F, Guillemot F. Sequential phases of cortical specification involve Neurogenin-dependent and -independent pathways. *EMBO Journal* 2004;23(14):2892-2902.

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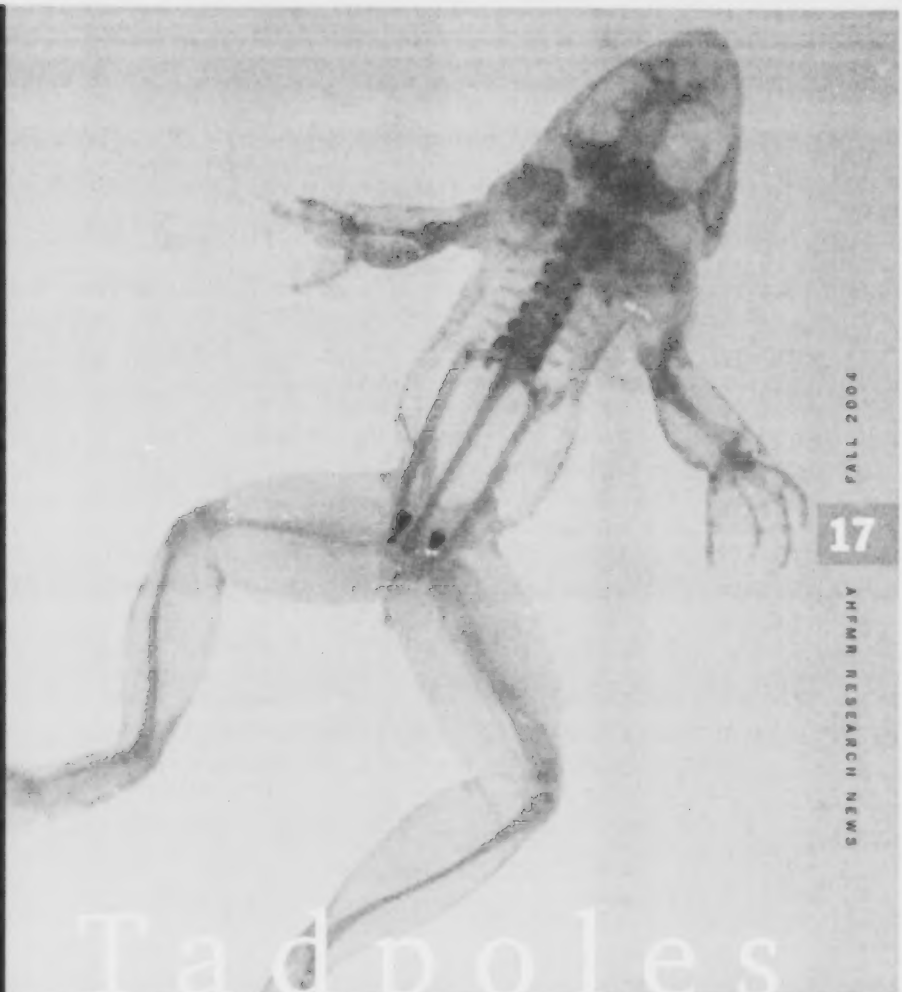
Schuurmans C, Guillemot F. Molecular mechanisms underlying cell fate specification in the developing telencephalon. *Current Opinion in Neurobiology* 2002;12:26-34.



Tadpoles take on kidney disease

About 1.9 million Canadians have chronic kidney disease, according to the Kidney Foundation of Canada. Most don't know it, however, since the symptoms of kidney disease are silent for a long period of time. Page 18 ▸

Dr. Vize has also developed expertise in the care of South African frogs.

Kidney disease is a serious and increasingly common medical problem. Patients who suffer kidney failure need dialysis or even a kidney transplant to stay alive. But waiting lists for kidney transplants are very long in Canada—as long as eight years in some provinces. Tragically, a significant number of people on the lists die before they receive a kidney.

Heritage Senior Scholar Dr. Peter Vize researches kidney development and function, the role of genes in inherited kidney disease, and the formation of organs (organogenesis). He explores basic questions about how cells learn that they are to form a kidney, and how they respond to this information and activate the appropriate gene-expression patterns.

The kidney has been used as a model for studying organogenesis for many years, but usually through the study of mice. Dr. Vize argues that amphibians have various advantages for studying early embryonic development. He and his colleagues are able to perform experiments in frog embryos that would be impossible to do in humans or, indeed, in any mammal. "In a mammal you can't just look into a kidney and see what's going on. You have to do an operation," he explains. "The frog embryo is transparent. The kidney lies right below the skin and is easy to see in the large embryos. You can see what's going on in a tadpole embryo within a couple of days."

Another advantage is that the lab can generate thousands of embryos at a time, since the frogs need little persuasion to mate. Dr. Vize and his team can observe the early development of the kidney in a simple saline solution. The frog embryos develop very quickly, so lab members can study the effect of injections on kidney development within days. It's fairly easy to inject and manipulate genes in frog eggs, and also easy to visualize gene expression in the tadpole.

"There are a couple of different things that we've uncovered in frogs that have subsequently been shown to hold true in mammals," he says. "The lessons from the frog are relevant to all of us. It's a great system with which to study congenital kidney disease."

In the course of his work, Dr. Vize has also developed expertise in another area—the care of frogs. His University of Calgary lab houses a large colony of African Clawed frogs (*Xenopus laevis and Xenopus tropicalis*). Dr. Vize has become such an expert on housing, rearing, and caring for these South African frogs that people from around the world visit his web site to learn about their care.

Dr. Vize, who came to Alberta from the University of Texas, hopes the genetics and kidney function research being done in his lab will one day lead to new drug treatments for kidney disease. "The Heritage Foundation provided a wonderful opportunity for me to expand my research program," he says.

Waiting lists for kidney transplants are very long in Canada.

Dr. Peter Vize is a Heritage Senior Scholar and associate professor in the University of Calgary's Department of Biological Sciences, Faculty of Science; as well as the Department of Biochemistry and Molecular Biology in the Faculty of Medicine. He also receives funding from CIHR and the Alberta Network for Proteomics Innovation (ANPI).

Selected publication

Vize P, Woolf AS, Bard J (eds.). *The Kidney: From Normal Development to Congenital Disease*. Amsterdam: Academic Press; 2003.

ABOVE: DR. PETER VIZE

Mouthguards and sports-related concussions

Dr. Brian Benson is living his dream career. A Calgary physician who loves sports, particularly hockey, he practises sports medicine and conducts research projects that could ultimately help reduce sports-related concussion injuries.

Mouthguards and ice hockey

Dr. Benson is a Heritage Clinical Research Fellow investigating the risk of concussion associated with mouthguard use in the National Hockey League (NHL). He wants to determine if the risk of concussion among NHL hockey players wearing mouthguards is higher or lower than the risk in players not wearing them.

Concussion is a significant problem in hockey at all levels, from youth to professional. Various anecdotal reports suggest that mouthguards may help reduce the risk of concussion by reducing the force transmitted by a blow to the jaw. Mouthguards are mandatory at several different levels in hockey and football, on the premise that they can prevent concussion. However, Dr. Benson explains that, although it has been proven that mouthguards custom-fitted by dentists can prevent dental injuries when worn properly, their value in preventing concussion has never been studied or proven outside of the laboratory.

"After reading the literature on this issue, I hypothesized that mouthguards do play a role in concussion prevention," he says. In 2002, Dr. Benson published a study on the risk factors for concussion among 642 male hockey players wearing either full face shields or half face shields (visors). He and his colleagues found that the use of a full face shield significantly reduced the playing time lost because of concussion as compared with the use of a half face shield—suggesting that the severity of concussion may be reduced. The study also seemed to suggest that mouthguard use reduced concussion severity. "We decided to test this on humans. We're doing that in the NHL—all 30 teams—with 750 subjects. This is a lot of fun. I'm able to stay involved with the sport I love and do research in an area where it can make a difference. It's great."

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LEFT: DR. BRIAN BENSON

What is concussion?

Concussion has been defined as a "trauma induced alteration in mental status". It's one of the most dangerous types of injury sustained in sport.

Nine times out of ten, a concussion injury sustained during a sports event will be mild, causing temporary confusion, brief amnesia, and no loss of consciousness. The trainer will ask players who may have sustained concussion to rest, and he will observe them until their symptoms cease. However, it is important for players, coaches, and parents to realize that no brain injury is trivial. Each brain injury has the potential to be fatal and repeated minor head injuries may result in brain damage.

Study results could have a significant impact upon the game of hockey.

"You're at risk in any sport you play," stresses Dr. Benson. "People used to play through the symptoms. They'd be hit, they'd have a headache and blurred vision, they'd continue playing and wouldn't tell anyone. Nowadays there's increased public awareness of concussion. Athletes and coaching staff are more aware of it. They know the consequences: that concussions may cause cumulative damage that affects the player's whole life functionally. It's important people do realize that if they develop a traumatic headache or symptoms such as nausea and blurred vision, they need to let the medical staff know. They need to be treated appropriately. They should also see a physician with an interest in sport-related concussion."

Concussion is a significant problem in hockey at all levels.

Dr. Benson conducted this study during last year's NHL season, and the data is currently being analyzed. While it looks as though the NHL lockout will prevent him from collecting another year's worth of data as he had hoped, Dr. Benson is confident that he already has enough information. The preliminary results should be published early in 2005. It is possible that the study results will have a significant impact upon the game of hockey and its rules.

"We don't want to change the nature of the game," stresses Dr. Benson. "We want to reduce the risk in sport without changing the game. Right now hockey players are wearing full facial protection and mouthguards at the amateur level to prevent concussion, but mouthguards may not work. It will be very interesting to see the results of this study."

Dr. Benson has been working with the NHL's injury-analysis panel and is also trying to identify specific risk factors for concussion. He and his colleagues hope to work on more effective preventive strategies to reduce the risk of potential long-term disability associated with concussion, a subject of great importance to Dr. Benson. In his clinical fellowship at the University of

DR. BRIAN BENSON

Calgary Sport Medicine Centre, he sees a lot of patients with concussion-related injuries, including members of the University of Calgary Dinos football team.

Headgear in soccer

Dr. Benson is also seeking funding to research the use of a soft-shell type of headgear in amateur soccer to prevent concussion injuries. As with the hockey question, studies have been conducted in the laboratory but not in the field.

"This is a brand new area," he says. "FIFA–the Fédération Internationale de Football Association–is the sport-governing body for soccer throughout the world. FIFA has given the okay that players can go ahead and wear headgear. In fact, now a few US leagues have mandated headgear use. It's starting to catch on. Amateur players are starting to wear this protective headgear too."

The path to sports medicine research

Dr. Benson's interest in sports medicine grew from his own love of sports. At the age of 18 he moved to Penticton, BC, to play Junior A hockey and later moved to Calgary to attend Mount Royal College and play collegiate hockey. Since then, he has gained a bachelor's degree in physical education, a master's degree in epidemiology, a medical degree, and family medicine residency training. He is in the final year of his sports medicine fellowship. In 2003 he began a Ph.D. in clinical epidemiology.

Dr. Brian Benson is an AHFMR Health Research Clinical Fellow at the University of Calgary Sport Medicine Centre. He is also a Ph.D. candidate in clinical epidemiology in the Department of Community Health Sciences, and a trainee in the Alberta Provincial CIHR (Canadian Institutes of Health Research) Training Program in Bone and Joint Health. Dr. Benson's mentor and supervisor is Dr. Willem Meeuwisse, who was team physician to the Calgary Flames for six years and is currently the NHL's injury epidemiologist.

Selected publications

Benson BW, Rose MS, Meeuwisse WH. The impact of face shield use on concussions in ice hockey: a multivariate analysis. *British Journal of Sports Medicine* 2002;36(1):27-32.

Benson BW, Mohtadi NGH, Rose MS, Meeuwisse WH. Head and neck injuries among ice hockey players wearing full face shields vs half face shields. *Journal of the American Medical Association* 1999 Dec 22/29;282(24):2328-2332.

A lucky break

Osteoporosis Society of Canada
http://www.osteoporosis.ca

Doing better for vascular disease

AHFMR Programs in Health Services Research
http://www.ahfmr.ab.ca/grants/hrs/index.shtml

Youth suicide prevention

AHFMR Health Technology Assessment
http://www.ahfmr.ab.ca/hta/

Alberta Mental Health Board
http://www.amhb.ab.ca/

Drawing breath

University of Alberta Pulmonary Research Group
http://www.departmentofmedicine.ualberta.ca/prg

University of Calgary Respiratory Research Group
http://www.ucalgary.ca/~resprg/

Alberta Asthma Centre
http://www.asthmacentre.org

COPD and Asthma Network of Alberta (CANA)
http://www.canhome.org

Tadpoles take on kidney disease

Kidney Foundation of Canada
http://www.kidney.ca

Xenbase: a Xenopus web resource
http://www.xenbase.org

Genes and decision-making in the brain

University of Calgary Genes and Development Research Group
http://www.ucalgary.ca/gdrg/

University of Calgary Neuroscience Research Group
http://www.ucalgary.ca/~neuro/

Mouthguards and sports-related concussions

Hockey Injuries.com
http://www.hockeyinjuries.com

2004 AHFMR Media Fellows

AHFMR Media Fellowship program
http://www.ahfmr.ab.ca/communications/fellowship.shtml

2004 AHFMR Media Fellows

Dominika Boczula, B.Sc. student, University of Calgary

I have always been interested in, and involved in, various activities which seem to have nothing in common with my future career as a physician–this summer, for example, I was the recipient of the AHFMR Media Fellowship at CBC Radio Calgary.

I loved coming to work every morning at CBC! My summer consisted of morning meetings, interviews, pre-tapes, writing scripts, along with too many e-mails and phone calls to mention. I truly enjoyed being treated as a "regular" reporter, complete with the expectations that I would provide story ideas every morning and meet the "we need this by 4 p.m." deadlines. I discovered the process that a story undergoes from initial conception to the final airing, along with the "smoke and mirrors" frequently used in Radioland. In my first week, I interviewed the Calgary Flames after their Stanley Cup run, and I warned the public of potential lead poisoning from children's toys. In the course of my 12 weeks I also profiled a very concerned doctor opening a pediatric obesity clinic and introduced CBC listeners to "space sickness"–the equivalent of airsickness, but in space.

RIGHT: DOMINIKA BOCZULA

Now that the Media Fellowship is completed, I will remain as a freelance reporter for CBC Radio while attending the University of Calgary. In fact, I already have stories in mind for the fall...

Kieran Halloran, Medical student, University of Alberta

My experience at CBC Radio this past summer was amazing. I was allowed to do many varied and interesting tasks, but was also free to pursue my own interests within the framework of the job, and in so doing, get a glimpse into how media works in our culture.

The health reporters actually treated me as an equal–even as the office authority on some medical issues. That level of trust and respect meant a lot, and made the job infinitely more satisfying.

My favourite aspect of my job, though, was creation. If I felt that an important medical issue wasn't getting any attention in the popular press, I could bring that issue to the story meeting, propose an angle, and then pursue it, for however long it took. I was also able to bring a new mini-feature to CBC Radio with the help of the staff: the Medical Minutes. These were brief segments which I voiced on air about medical issues I felt were important. I was entrusted with every aspect of their execution–from conception, through writing and editing, to recording and production.

ABOVE: KIERAN HALLORAN

At CBC I had the chance to see how a newscast is made, who makes the decisions, and why. The staff of CBC Radio One made this experience profoundly instructive and enjoyable for me; and for that, I would like to thank everyone who works there. It was the summer job of a lifetime.

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